8-05.1 PAVEMENT MARKING. Pavement marking is used to convey warnings or information to the driver without diverting attention from the roadway. Pavement marking consists of long-line markings, intersection markings, railroad crossings, bike lanes and any other pavement marking used to control traffic.

The designer should become familiar with Section 620 of the Standard Specifications, the Striping Manual and the Manual on Uniform Traffic Control Devices (MUTCD). Standard Plan 620 shows layouts for typical situations and is included in plans with pavement marking. All pavement marking is to conform to the MUTCD. Design of pavement marking plans should be coordinated with district traffic personnel.

Permanent pavement marking consists of furnishing and installing pavement marking that will remain after the project has been completed. Temporary pavement marking consists of furnishing, installing and maintaining pavement marking in work zones during construction of a project.

A layout of the permanent pavement marking should be detailed in plan sheets showing the color, type and location of the marking. Temporary pavement marking should be detailed in the Traffic Control Plan (TCP) separate from the permanent pavement marking plan sheets. A tabulation of all marking to be placed and removed is listed on the 2B quantity sheet. Pavement marking requirements not included in the standard or general specifications will require a job special provision as described in Subsection 4-03.13(1).

8-05.2 PERMANENT PAVEMENT MARKING. This work consists of furnishing and installing Type 1 preformed marking tape, acrylic copolymer paint, acrylic waterborne paint, extruded thermoplastic pavement marking, hot spray thermoplastic pavement marking, epoxy pavement marking or snowplowable raised pavement markers. On the final lift of resurfacing projects and on all new pavements, all pavement marking will be provided by contract. On surface treatment projects, all pavement marking will be provided by MoDOT forces.

Selection of permanent pavement marking is based on the material properties of the marking, traffic volumes, pavement type and project length. Figure 8-05.1 is a flow diagram that should be used for guidance in the selection of permanent long line pavement marking.

Intersection and specialty markings are normally of the same material chosen for the project.

Snowplowable raised pavement markers are used to supplement long line pavement marking. Use of snowplowable raised pavement markers is described in Subsection 8-05.2(6).

8-05.2 (1) EXTRUDED THERMOPLASTIC PAVEMENT MARKING. Extruded thermoplastic pavement marking is a molten, extruded plastic that is used on bituminous pavement surfaces with ADT greater than 3500. Extruded thermoplastic shall not be used on Portland Cement Concrete Pavement (PCCP) under any circumstances.

8-05.2 (2) HOT SPRAY THERMOPLASTIC PAVEMENT MARKING. Hot spray thermoplastic pavement marking is a molten, sprayed thermoplastic material that is used on bituminous pavements with ADT less than 3500. Hot spray thermoplastic shall not be used on PCCP under any circumstances.

8-05.2 (3) EPOXY PAVEMENT MARKING. Epoxy pavement marking is a two component, epoxy resin and amine curing agent, material that is available in slow cure, Type A, and fast cure, Type B, formulations used on pavements with an ADT of greater than 3500 and more than 1 mile [1.6 km] in length.

8-05.2 (3) (a) TYPE A EPOXY PAVEMENT MARKING. Type A epoxy pavement marking is a slow cure material that provides better adhesion to all surfaces and is the preferred epoxy pavement marking. Type A epoxy

pavement marking material shall be used on all new concrete and bituminous pavements.. Type A epoxy pavement marking should be used on surfaces that are open to traffic if proper traffic control can be used to ensure adequate curing time. Curing time for Type A epoxy under optimum conditions is approximately 45 minutes. This may require a lane closure.

8-05.2 (3) (b) TYPE B EPOXY PAVEMENT MARKING. Type B epoxy pavement marking is a fast cure material that may be used on bituminous pavement surfaces with ADT greater than 3500, open to traffic and greater than one mile [1.6 km] in length. Use of Type B epoxy pavement marking may result in decreased durability. Curing time for Type B epoxy under optimum conditions is approximately 10 minutes. Cones may be used to protect the marking during the cure period.

8-05.2 (4) PAINT FOR PAVEMENT MARKING. Paint is a sprayed material use on pavements with an ADT less than 3500.

8-05.2 (4) (a) ACRYLIC COPOLYMER PAINT. Acrylic copolymer paint is an acetone-based material that can be used at lower temperatures than waterborne..

8-05.2 (4) (b) ACRYLIC WATERBORNE PAINT. Acrylic waterborne paint is a waterborne material that is the primary material applied by MoDOT forces.

8-05.2 (5) TYPE 1 PREFORMED TAPE. Type 1 preformed tape has an adhesive plastic backing and retroreflective surface that is used on projects less than one mile [1.6 km] in length with ADT greater than 3500.

8-05.2 (6) SNOWPLOWABLE RAISED PAVEMENT MARKERS (SRPM). SRPMs consist of an iron casting to which is attached a replaceable prismatic retroreflector for reflecting light longitudinally along the pavement from either one or two directions as specified.

SRPM's should be placed on all interstate projects. SRPM's should be considered on all divided highways. SRPM's may be used in areas with high night time accident counts or poor wet visibility with approval from GHQ Design. SRPM's are used for lane lines and ramp gore areas as shown in Standard Plan 620.20. GHQ Bridge must approve placement of SRPM's on a bridge deck. SRPM's will not be used for edge lines or centerlines unless approved by GHQ Design.

For reflector replacement projects, the designer should make a field check to determine the number of castings that need to be replaced on the project. If more than 50 percent of the castings are missing, a complete replacement of SRPM's should be done. If complete replacement is not needed, the number of missing castings should be determined and included in the contract. On surface treatment and resurfacing projects SRPM's should be removed before operations and replaced after application of the surface treatment or resurfacing. Where cold milling is being done, the removal of the SRPM's is included in the cost of cold milling. Snowplowable Raised Pavement Markers should not be left in place and covered by surface treatment or resurfacing.

8-05.3 TEMPORARY PAVEMENT MARKING. Temporary pavement marking consists of furnishing, installing, and maintaining pavement marking in work zones. Temporary pavement marking may be used as a short term replacement for existing marking for grinding, milling and resurfacing, but no direct payment is made to the contractor as described in Sec 620 of the Standard Specifications. Standard Plan 620.10 shows layouts for typical situations. Temporary marking should be used with pay items where the traffic pattern has changed during construction due to bypasses, lane shifts, narrow lanes, etc.

8-05.3 (1) PAINT FOR PAVEMENT MARKING. Waterborne or acrylic copolymer paint may be used on temporary bypasses or any pavement that will be removed at the end of the project or on pavements where resurfacing will cover the striping. Paint may also be used to delineate temporary traffic lanes where the pavement markings are not in their final locations, such as lane shifts during stage construction, however the removal of paint will result in scarring of the pavement. These factors should be considered before the decision is made to use temporary paint on final wearing surfaces. On final wearing surfaces, preformed removable marking tape is the preferred temporary pavement marking material.

Paint requires special equipment to install and remove, however material costs are low, so it is cost effective to install in large quantities. The advantage of paint is that it can be installed faster than other types of pavement marking material. This is particularly an advantage where striping must be placed and removed under traffic. The primary disadvantage is that the removal of paint is expensive and will result in scarring of the pavement. A pay item for removal of paint will be included if removal is required.

8-05.3 (2) PREFORMED REMOVEABLE PAVEMENT MARKING TAPE. Preformed removable tape is used to delineate traffic lanes during construction as described above under pavement marking paint.

Preformed removable tape does not require special equipment to install or remove, however material costs are high, so it may only be cost effective in small quantities. The primary advantage is that the removal of this tape is inexpensive and will not scar the pavement. The primary disadvantages of tape are the higher material cost and weather constraints for installation. When establishing contract times and milestones as provided in Subsection 4-03.16, the potential timing of paving activities and weather constraints should be considered when selecting temporary pavement marking.A pay item for removal of the marking tape will be included if removal is required.

8-05.3 (3) PREFORMED SHORT-TERM PAVEMENT MARKING TAPE. Short-term pavement marking tape is used in locations where the marking will be in place no more than two weeks. It is cost effective only in small quantities. Short-term pavement marking is not normally removed. If removal is required, removable tape is the preferred material. Short term marking should not be used for temporary lane transitions or bypasses.

8-05.3 (4) TEMPORARY RAISED PAVEMENT MARKERS. Temporary raised pavement markers are used on contract leveling course and resurfacing projects on two or three lane roadways with no passing zone center striping to provide a temporary centerline until permanent marking is replaced. Type 1 temporary raised pavement markers should only be used on pavement surface treatment projects. Surface treatment is defined as any pavement surfacing that is not asphaltic hot mixed. Type 2 temporary raised pavement markers should be used on all other projects. Temporary raised pavement markers are used in combination with the No Center Stripe sign described in Subsection 8-04.2(2). Temporary markers should also be used to provide a temporary lane line on 2-lane roadways with climbing lanes. Temporary markers may also be used to supplement other pavement marking in areas where emphasis is needed, such as on bypasses and lane transitions.

Markers dividing two lanes of traffic in the same direction have one reflective face that is white in color. Markers dividing two lanes of traffic in opposite directions have two opposing reflective faces that are yellow in color. Edge line markers are yellow for the left edge line and white for the right edge line. Where markers are used to emphasize edge lines in sharp curves or tapers, recommended spacing is 15 ft. [4.5 m]. Where they are used to emphasize intermittent lines or solid lines in tangent sections, recommended spacing is 40 ft. [12 m]. Other spacing may be used according to conditions.

Temporary raised pavement markers do not require removal unless they conflict with the final marking. They do not require a pay item for removal, but if removal is required it should be indicated on the plans.

8-05.4 PAVEMENT MARKING REMOVAL. This work consists of removing all existing or temporary pavement marking which is conflicting or might mislead traffic. The exception is short term marking tape which should be in place two weeks or less, as described in Subsection 8-05.3(3). Provisions should be made on the TCP for the removal of all conflicting or misleading markings. Pay items should be provided for removal of pavement marking when required.